PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-235780

(43)Date of publication of application : 29.08.2000

| (51)Int.Cl. | G11B 27/00 |
	G11B 20/12
	H04N 5/85
	H04N 5/92

(21)Application number : 11-036325	(71)Applicant : NEC CORP
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(54) DISK STORAGE MEDIUM AND PICTURE RECORDING AND EDITING AND REPRODUCING METHOD THEREFOR AND PICTURE RECORDING AND EDITING AND REPRODUCING DEVICE THEREFOR

(57)Abstract:

PROBLEM TO BE SOLVED: To enable a user to record titles indicating contents of plural pieces of contents and to manage them by allowing recording positional information of voice data corresponding to picture data to be included in the file managing information and dividing an area where the voice data are recorded in ECC block units.

SOLUTION: The volume name of a disk, titles of contents, the number of PPC files expressing the number of contents in the disk and positional information of respective PPC files, object attribute information and information of a recording date, a recording time, the recording mode of picture data, the recording mode of a voice data and the index of a thumb nail or the like are housed in a title managing file 11 and they are managed. When contents of videos are recorded in a video file directory 3, picture data are subjected to an MPEG 2-compression coding and voice data are subjected to an MPEG-voice coding and the voice data are made to be streams of GOP units and they are recorded in an MVF file 31 by being divided in ECC block units.
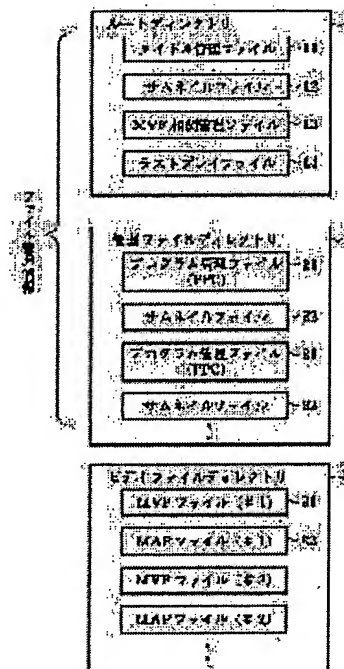
LEGAL STATUS

[Date of request for examination] 24.03.1999

[Date of sending the examiner's decision of rejection] 28.05.2002

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision   2002-11946
of rejection]

[Date of requesting appeal against examiner's   27.06.2002
decision of rejection]

[Date of extinction of right]

[0006]

[Problems that the Invention is to Solve]

When using a high-capacity optical disk enabling a user to record plural pieces of video contents in one disk as videotape, it is possible to record plural pieces of video contents in one disk. In this case, without the managing information to enable the user to recognize at a glance titles and contents of the recorded video contents (or music contents) as an index and to manage them collectively, it is complicated for the user to manage them.

[0007]

In addition, by using a high-capacity optical disk enabling the user himself or herself to record and reproduce the data, the user himself or herself is capable of erasing and editing as a video tape. For example, the user sometime wants to cut only a CM time zone when recording the video contents. According to a conventional video tape, in order to erase this CM time zone, it is necessary to re-record the video contents with the exception of the CM time zone in another video tape.

[0008]

On the contrary, since random access is available in a disk storage medium, by erasing the CM time zone and editing so as to jump to a start position of a continued screen of the

contents, the disk storage medium can perform editing peculiar thereto to reproduce the data without making the user to aware that the CM time zone is cut. However, there is no proposal regarding how to compose the file managing information for such editing and how to edit the information.

[0009]

In addition, the user himself or herself can replace the picture with the voice by editing the contents or the like, so that it is possible not only to erase the contents but also to connect the contents each other. For example, the operation to entirely replace a voice part of a background of the picture is possible. In the event of performing such editing, there is no proposal regarding how to manage the edited contents.

[0010]

In addition, it is conceivable that the contents are not recorded and reproduced by one piece of disk storage medium but plural pieces of disk storage mediums are stored in one cartridge so as to record and reproduce the data in this cartridge unit. Further, in consideration of recording plural pieces of contents, it is easy to manage the data in a cartridge unit. However, there is no proposal regarding a method to manage many contents that are recorded in plural pieces of disk storage mediums within one cartridge.

[0011]

In addition, there is no proposal regarding how to manage

2

the contents in the event of housing plural pieces of disk storage mediums in the cartridge and recording the contents across the plural pieces of disk storage mediums.

[0012]

The present invention has been made taking the foregoing problems into consideration and an object of which is to provide a disk storage medium to enable a user to record titles indicating details of plural pieces of contents that are recorded in one or plural pieces of disk storage mediums and to manage them; and a title managing method therefor. In addition, another object of the present invention is to provide a disk storage medium to enable a user to edit the recorded contents (for example, erase or connect the recorded contents) and a managing method therefor. Further, still another object of the present invention is to provide a managing method of a file when the user edits the contents. Further, still further object of the present invention is to provide these managing methods, a recording and reproducing device using a disk storage medium, and a recording and reproducing method threfor.

[0013]

Particularly, an object of the present invention is to provide a recording and reproducing device capable of editing the voice data separately from editing the picture upon editing the voice; and a recording and reproducing method therefor.

[0014]

[Means for Solving the Problems]

According to the present invention, in a file configuration of the data to be recorded in a disk storage medium, the managing information are recorded in a specific area that is secured in advance as file managing information. As this file managing information, titles of the recorded contents, an object type of the attribute information indicating what the content is, a title managing file such as information regarding recording of start time information and end information of data recording. or the like, outline information file indicating the details of the contents, a program managing file to be used for editing the recorded data file and representing a connection relation of the edited data file (program playback chain, hereinafter, a PPC file), information regarding recording of the start time information and the end information of data recording or the like, a correlation managing file indicating a reference relation between the program managing file referring to the data file and the data file, and a last play file indicating the positional information in the content that the user lastly accesses (so-called book mark function) or the like are stored.

[0015]

At this point, as the outline information, character information expressing a summary of the contents and a thumb nail picture as a contracted picture of a frame of an input picture or the like can be considered, however, according to the present

4

invention, hereinafter, the outline information will be described as the thumb nail data. In addition, it is assumed that as a picture compression coding system, MPEG 2 is used, a predetermined processing unit including plural frames will be described as a GOP unit (Group of Picture), and a coded picture in the frame will be described as an I-Picture.

[0016]

In addition, a picture voice is recorded as a picture voice file, and the picture voice file is composed of a compression-coded picture voice data file (Multi-media Video File, hereinafter, referred to as a MVF file) and a map file for managing the MVF file of these picture/voice data (MAP).

[0017]

This map file has a block address of ECC (Error Correction Code) from a head position of the MVF file that is compression-coded for each GOP unit, the number of the ECC blocks of an object GOP, the number of the ECC blocks of the I-Picture in the object GOP, and the positional information of the start frame for reproducing the data in the object GOP and the end frame. Due to this map file, it is possible to manage the compression-coded picture/voice data in GOP units. In addition, by having the ECC block address from the MVF file head position of the voice data in the object GOP and the information expressing the number of the ECC blocks, it is possible to perform after record editing of the voice data.

5

[0018]

Upon formatting the disk, a file managing information area is created in a head part of the disk. The file managing information may include the items that can be created by the user or can be changed by editing or the like, so that a predetermined volume thereof is secured as the file managing information area.

[0019]

In this time, by recording the picture data and the voice data in the different areas, respectively, it is possible to read the voice data and the picture data separately or it is possible to write them separately. Thereby, upon editing the voice, it is possible to perform after recording and add the voice data easily. The addition of the voice data can be used in the case that, for example, the voice data in English is newly added to the voice data that has been already recorded in Japanese, and in reproduction, any voice can be selected from among two languages.

[0020]

In other words, a first aspect of the present invention is a disk storage medium in which the file managing information including the positional information of the program managing file managing the streams of the plural pieces of contents that are compression coded and recorded by using a variable length code is recorded in a specific area.

6

[0021]

In this case, the present invention is characterized in that the above-described file managing information may include the recording positional information of the voice data corresponding to the picture data and the area in which this voice data is recorded is divided in ECC block units.

[0022]

In addition, the files of the picture and or the voice data that are recorded in the disk storage medium, in which the picture or the voice is recorded as the data file that is compression coded by a variable length code, is configured by a data file, in which the streams of the above-described compression coded picture and or voice data are recorded in block units; and a map file including the address information for managing this data file. The above-described map file may include the positional information in predetermined processing units including plural frames and the number of the blocks of the compression coded picture and or voice; and the positional information and the number of the blocks of the voice that is compression coded in the above-described predetermined processing units.

[0023]

It is preferable that the area, in which the above-described voice data is recorded, is provided for each 1 GOP unit of the compression coded picture. Further, it is

7

preferable that the area, in which the above-described voice data is recorded, is divided into a plurality of areas.

[0024]

In addition, the above-described file managing information may include a correlation managing file describing which program managing file refers to which data file; and when erasing or connecting the data file having the picture data and/or the voice data recorded therein, if there is another program managing file referring to the above-described data file, it is preferable that erasing or connecting is prohibited unless the operation of the other program managing file is performed in advance.

[0025]

It is preferable that the above-described file managing information may include a last play file indicating a position of the picture data file or the voice data file, to which the access is completed at last, for each recorded content.

[0026]

It is preferable that the above-described file managing information may include a title for each recorded content and an outline file indicating the details of the above-described content.

[0027]

A second aspect of the present invention is a disk reproducing method of reading the file managing information

8

recorded in a specific area of a disk storage medium that has been secured in advance when the above-described disk storage medium is inserted into a disk reproducing device.

[0028]

In this case, the present invention is characterized in that the picture data and the voice data are recorded in the different areas in the above-described disk storage medium, respectively, the information of the above-described different areas are recorded in the above-described file managing information, respectively, and when inserting the above-described disk storage medium into the disk reproducing device, the disk reproducing device may read the above-described file managing information and reproduce the desired picture data and voice data by rearranging them so as to be synchronized each other.

[0029]

A third aspect of the present invention is a disk reproducing device including means of reading the file managing information that is recorded in the specific area of a disk storage medium that has been secured in advance when inserting the above-described disk storage medium into the disk reproducing device.

[0030]

In this case, the present invention is characterized in that the picture data and the voice data are recorded in the

9

different are respectively in the above-described disk storage medium; the information in the above-described different areas are recorded respectively in the above-described file managing information; and the above-described disk storage medium may include means of reading the above-described file managing information when inserting the above-described disk storage medium in the disk reproducing device and means of rearranging and reproducing the desired picture data and voice data so as to be synchronized with each other in accordance with the file managing information that is read by this reading means.

[0031]

A fourth aspect of the present invention is a recording method of a disk storage medium of extracting the positional information in predetermined processing units including compression coded plural frames as the map information upon recording the contents by performing compression coding to the disk storage medium; and which disk storage medium may include a file managing information area as a specific area other than the recording area of the content data.

[0032]

In this case, the present invention is characterized in that the picture data and the voice data are recorded in the different areas respectively in the above-described disk storage medium; and the information of the above-described different areas are recorded respectively in the above-described file

10

managing information.

[0033]

A fifth aspect of the present invention is an editing method of the recorded picture stored in a storage area of the file managing information of recording the positional information in predetermined processing units including plural frames of the compression coded picture data and voice data in the disk storage medium as a map file; editing the recorded file of the picture and voice data in the predetermined processing units; housing the edited file so as to indicate the position of the continuous picture data and voice data of this editing result; and housing this program managing file in a storage area of the file managing information performing file management of the disk storage medium.

[0034]

In this case, the present invention is characterized in that, for each of the above-described predetermined processing, an area having the voice data corresponding to the picture data of this processing stored therein is provided; the positional information of the voice data that is recorded in the above-described area having the voice data stored therein is recorded in the above-described program managing file; and the voice data that is stored in this area having the voice data stored therein is updated or added.

[0035]

11

It is preferable that a vacant area having new voice data added therein is given in the above-described area having the voice data stored therein.

[0036]

A sixth aspect of the present invention is a picture recording and editing device of a disk storage medium. The present invention is characterized by including means of compressing coding the details of picture recording in the disk storage medium; means of recording the coded picture and voice data as a data file for each content; means of generating a map file of the positional information of the recorded picture and voice data; means of reading and decoding the above-described recorded data file; memory means of housing a program managing file managing streams of the above-described data file as the file managing information; and input means of inputting edit instruction; and a result of erasing or connecting the above-described data file by the operation inputted by the above-described input means is stored in the above-described program managing file in predetermined processing units including plural frames of the data file.

[0037]

[Mode for Carrying Out the Invention]

The embodiment(s) of the present invention will be described below with reference to the drawings.

[0038]

FIG. 1 shows an example of the embodiments of the present invention and illustrates a file configuration to be provided to a disk storage medium. FIG. 2 shows a configuration of a root directory. FIG. 3 shows a configuration of a managing file directory. FIG. 4 shows a configuration of a video file directory. In the following embodiments of the present invention, the data to be recorded in the disk storage medium will be described as the data that is compression coded by using a MPEG 2-picture coding system and an MPEG-voice coding system.

[0039]

The files that are recorded in a root directory 1 and a managing file directory 2 shown in FIG. 1 correspond to the file managing information managing the recorded contents. This file managing information is provided in a specific area of the disk storage medium. This specific area is secured in advance as an area having the file managing information recorded therein, and further, the capacity of the file managing information is varied by recording and editing the data or the like by the user, so that predetermined capacity is secured in advance in initialization of the disk.

[0040]

The file managing information is divided into a root directory 1 and a managing file directory 2. The root directory 1 is configured by a title managing file 11, a thumb nail file 12, an MVF correlation managing file 13, and a last play file

13

14. The title managing file 11 is a file for managing the contents of a disk or an entire cartridge. As shown in FIG. 2, the information such as a volume name of a disk, titles of contents, the number of PPC files expressing the number of the contents in the disk, the positional information of respective PPC files and object attribute information, and information of a recording date, a recording time, the recording mode of picture data, the recording mode of a voice data, and the index of a thumb nail or the like are stored in this title managing file 11 to be managed therein.

[0041]

In this case, the above-described object attribute information is the information expressing the class such as an MPEG 2 moving picture, an MPEG voice, a Dolby AC voice, a JPEG still picture, and a non-compression still picture data or the like; and upon reproducing the contents, the object attribute information may instruct the user what reproducing processing he or she should perform.

[0042]

In addition, the index of the above-described thumb nail may instruct the data position in the thumb nail file 12.

[0043]

As shown in FIG. 2, the thumb nail file 12 may record the data so that the details of the contents can be understood together with the respective titles of the contents when inserting the

disk storage medium in the reproducing device. The thumb nail file 12 may record a downsized still picture of about 100 pixels × 75 lines.

[0044]

According to the present embodiment, separating the title managing file 11 from the thumb nail file 12 and using the thumb nail index in the title managing file 11, the thumb nails of respective contents are stored in the thumb nail file 12. In this case, since the recording capacity of the thumb nail data is larger than that of the PPC file, when reproducing the data by an inexpensive recording and reproducing device having insufficient memory, not by reading the thumb nail file 12 but by reading the title information that is recorded in the PPC file, it is possible to inform the user of the content information that is recorded in the disk storage medium, and further, it is possible to maintain compatibility with a recording and reproducing device of a different specification. If the user does not have various versions of recording and reproducing devices as described above, it is also possible to store the thumb nail file 12 in the title managing file 11 and to manage it therein.

[0045]

The MVF correlation managing file 13, as shown in FIG. 2, is a file for adjusting the competition of the video data recorded in the video file directory 3, to which the PPC file

15

to control the reproduction of the recorded contents refers, and it records whether or not respective PPC files refer to the MVF file 31 in the vide file directory 3. In this case, the PPC files referring to respective MVF files are recorded, and upon editing the contents, for example, when the user intends to erase a certain MVF file entirely, the MVF correlation managing file 13 may inform the user that the user cannot erase the data if there is the PPC file referring to the MVF file to be erased, or it may reconstruct the GOP information of the PPC file that is necessary to be changed due to erase of the MVF.

[0046]

The last play file 14, as shown in FIG. 2, may carry out a function of so-called book mark. In the last play file 14, the name of the PPC file that the user lastly reproduced and the last reproduced GOP positional information of the PPC file are recorded, or when the disk storage medium is configured by a cartridge, the information such as the disk number of the disk where the PPC file that is reproduced lastly is located or the like is recorded therein. In the case of the recording and reproducing device using a tape storage medium, if the user ejects the tape storage medium from the recording and reproducing device without rewinding it when stopping the reproducing processing or after finishing the recording processing and the user inserts the tape in the device again, the tape storage medium stops at the position where it stops previously. On the contrary, in

such a case, since the disk storage medium cannot detect the physical head stop position, by recording the position of the contents that are lastly reproduced in the last play fie 14, it is possible to carry out the function to reproduce the data from the previous stop position as same as the recording and reproducing device using the tape storage medium.

[0047]

When the user sets a recording protection notch for prohibiting error recording, the last play file 14 cannot be used because the disk storage medium is prohibited from recording the data therein, however, by storing a unique ID of the disk storage medium and the information of the last play file 14 in an nonvolatile memory in the recording and reproducing device, it is possible to carry out the function that is identical with that of the last play file 14 in the same recording and reproducing device.

[0048]

In addition, when the disk storage medium is housed in a cartridge, it is also possible to carry out the function that is identical with that of the last play file 14 by giving the nonvolatile memory to the body of the cartridge and storing the information of the last play file 14 therein.

[0049]

Next, a file of the managing file directory 2 will be described below. The managing file directory may include a PPC

17

file 21, a thumb nail file 22, and a MAP file 32. The managing file directory may be arranged in the disk storage medium where the root directory is located or it may be arranged in each disk storage medium.

[0050]

The PPC file 21 may manage streams of the contents and it is used for editing and reproducing the recorded video contents or the like. This PPC file manages the object MVF file by GOP units, and as shown in FIG. 3, in the PPC file, an ECC block address from a head position of the MVF file as the positional information of the object GOP to specify the file index of the object MVF file and the object GOP, the number of the ECC blocks of the object GOP, the number of the ECC blocks of the I-Picture included in the object GOP, a start frame position and an end frame position of the object GOP, and a start offset address and the number of the ECC blocks of the voice data included in the object GOP are stored respectively. Thereby, on the basis of the information of the PPC file, by accessing the MVF file in which the object contents are stored, the contents can be reproduced.

[0051]

As shown in FIG. 3, the thumb nail file 22 stores the thumb nail picture of the MVF file corresponding to the PPC file as the still picture therein, and the file configuration thereof is identical with that of the thumb nail file 12 of the root

18

directory 1.

[0052]

The MAP file 32 is a file to manage the MVF file 31, and as shown in FIG. 4, the information such as the number of total GOP of the MVF file 31, an ECC block address from a head position of a MVF file of the object GOP expressing the managing information of respective GOP, the number of ECC blocks of the object GOP, the number of the ECC blocks of the I-Picture included in the object GOP, and a reproducing start frame position and a reproducing end frame position of the object GOP are stored therein. For example, when the number of picture frames in the GOP is 15, 1 is recorded as a value of the start frame position and 15 is recorded as a value of the end frame position. In addition, with respect to the voice information, the start positional information of the voice data and the number of the ECC blocks in the object GOP are also stored. The above-described one MAP file 32 is provided for one MVF file 31, and when generating (recording) the MVF file 31, the MAP file 32 is automatically created. In other words, upon recording certain content, if the MVF file 31 is created, the managing information for each GOP is automatically taken in and the MAP file 32 is created.

[0053]

Next, the video file directory 3 will be described below.

[0054]

As shown in FIG. 4, the MVF file 31 is a file wherein the

picture data or the voice data of respective recorded contents are stored. For example, the data obtained by compressing the picture and voice signal by the MPEG 2 is aligned and recorded in ECC block units for each picture data and each voice data in GOP units. At this point, since the number of picture frames per second is 29.97 in a NTSC system broadcast in Japan and U.S.A. or the like, the number of frames composing one GOP is often 15, however, it is not limited to 15. Particularly, if the MVF file 31 has a variable GOP configuration, the number of frames composing the GOP is changed adaptively due to change of the scenes or the like. By reading the compression coded data from this MVF file and carrying out decoding processing, the picture data and the voice data are reproduced.

[0055]

FIG. 16 shows an example of data arrangement of the compressed data that is used in a DVD-ROM. In the drawing, V represents compressed picture data and A represents compressed voice data, respectively. The data is recorded for sector units (generally, 2KB). On the contrary, in the MVF file according to the present invention, the compressed voice data is arranged in ECC block units after the compressed picture data in the GOP data.

[0056]

For example, in the event of replacing the voice data, a format to be used for a DVD-ROM has no managing information

regarding the voice data position and has no pattern of the data arrangement, so that this format needs means of reading all of the compressed data in the necessary parts by turns from an optical disk 50 and recording the voice data to be newly replaced at sector positions that are determined as a voice data part, and this makes it impossible to easily replace the voice data. FIG. 17 shows an example of the data arrangement of the compressed data according to the present invention. By contrast, as shown in FIG. 17, the MVF file having the data arrangement of the present invention arranges the data in ECC block units in addition to managing the voice data position at the MAP file 32, and this has an advantage such that the voice data can be replaced without reading them from the optical disk.

[0057]

Upon adding the voice data, for example, it is considered that the data is recorded in English 2ch after recording it in Japanese 2ch. At this point, it is assumed that the voice data area to be added is secured upon recording in advance. In the format of the DVD-ROM, as same as the above-described replacement of the voice data, it is not possible to determine the voice data part unless all of the compressed data in the necessary parts are read by turns. On the contrary, since the data arrangement of the present invention only reads the voice data part from the optical disk in accordance with the MAP file to record the added voice in the area that is secured in advance,

21

this makes it possible to easily add the voice data.

[0058]

In addition, since the MAP file 32 has a start address of the GOP and the number of ECC blocks of the I-Picture in the GOP, it is possible to know the file address, however, since the area of the I-Picture necessary for quick preview is unknown, it is necessary to detect an end point of the I-Picture data by performing decoding processing of the compressed data or to detect a header of the compressed data. On the contrary, according to the present invention, the number of ECC blocks is stored in the MAP file 32 managing the GOP information in addition to the start address of the I-Picture (i.e. the start address of the GOP), so that, without a decoder and without detection of the header, it is possible to perform address jump, data reading of the necessary number of the blocks and decoding continuously and this results in making it possible to perform quick review at higher speed than a conventional quick review.

[0059]

FIG. 5 shows an example of a file arrangement in the event of recording the contents across plural pieces of disk storage mediums when one cartridge includes plural pieces of disk storage mediums and the disk storage mediums in the cartridge are configured so that the user cannot eject them. FIG. 5 illustrates that a content No. 1 is recorded as a MVF file No. 1, a content No. 2 is recorded as a MVF file No. 2, and a half of a content

22

No. 3 is recorded as a MVF file No. 3-1 in a disk No. 1, respectively; and the other half of the content No. 3 is recorded as a MVF file No. 3-2 in a disk No. 2.

[0060]

In this case, the file managing information of the root directory file 1 is stored in a specific area at the head of the disk No. 1 and by using these file managing information, the contents of the entire cartridge are managed; and respective contents recorded in the disks No. 1 and No. 2 are managed by using the managing file directories 2 that are disposed for each disk. Thus, reproducing or recording the data with plural pieces of disk storage mediums stored in one cartridge is convenient for the user to manage the contents. Upon managing many contents that are recorded in the plural pieces of disk storage mediums stored in one cartridge, by recording the file managing information that is disposed at the root directory in the disk storage medium to be loaded at first when inserting the cartridge into the recording and reproducing device, the user can know the contents of the entire cartridge at higher speed than the case of recording the managing information of the root directory individually in the plural pieces of disk storage mediums. As described above in detail, a utility value of the present invention is high in that many content recorded in the plural pieces of disk storage mediums can be managed all at once by the file managing information provided in one piece of

23

predetermined disk storage medium.

[0061]

Next, the operation of the present invention will be described below with reference to FIG. 6 showing a constitutional example of a recording and reproducing device using a high-capacity optical disk.

[0062]

This recording and reproducing device may include an optical disk 50; an optical disk device 40; an analog input I/F 52 of A/D converting the picture/voice data to be inputted from a tuner and the other recording and reproducing device or the like; an MPEG 2 picture encoder 41 of compression coding the picture data by using an MPEG 2 coding system; an MPEG voice encoder 53 of compression coding the voice data by using an MPEG voice coding system; a multiplexer 48 of composing the compressed picture/voice data into one stream; a disk drive I/F 51 of inputting and outputting the multiplexed data and the managing file data in and from the optical disk device 40; a divider 49 of dividing the compressed picture/voice stream; an MPEG 2 picture decoder 42 of decoding the compressed picture data; an MPEG voice decoder 54 of decoding the compressed voice data; an analog output I/F 55 of D/A converting the decoded picture/voice data; a display 44 of outputting the picture data; a voice outputting device 43 of outputting the voice data; a control unit 45 of controlling the entirety of the recording

24

and reproducing device; a memory unit 46 of housing a control

program and the file managing information or the like therein;

and an operation unit 47 of inputting an instruction such as

editing and reproducing or the like.

[0063]

In this case, the muptiplexer 48 may rearrange the

compressed picture data and the compressed voice data for each

GOP so that they are aligned in ECC block units and may output

them to the disk drive I/F 51 as a stream; and at the same time,

it may output the number of the ECC blocks for each GOP, the

number of the ECC blocks of the I-Picture, an ECC offset address

of the voice data, and the number of the ECC blocks of the voice

data to the memory unit 46 managed by the control unit 45 through

a control bus. The control unit 45 may receive the managing

information for each GOP from the multiplexer 48, may perform

the processing for the MAP file information, and may update the

memory unit 46. If the recording operation is finished, the

control unit 45 may output the MAP file 32 to the managing file

directory 2. The disk drive I/F 51 is connected to the optical

disk device 40, an MPEG picture and voice stream bus, and the

control bus; and the disk drive I/F 51 is provided with a buffer

memory therewithin in order to control the data smoothly.

Further, FIG. 6 shows an example of a recording and reproducing

device, and the present embodiment can be realized without

depending to such configuration of the recording and reproducing

device of the present invention.

[0064]

Next, the entire operation of the recording and reproducing device will be described below with reference to FIG. 7. FIG. 7 is a flow chart showing the entire operation of the recording and reproducing device according to the present invention. If the optical disk 50 is inserted into the optical disk device 40, the optical disk device 40 may determine whether or not this optical disk 50 is a new one; and if it is a new optical disk, the optical disk device 40 may carry out initialization and may secure the areas of the root directory 1 and the managing file directory 2 as shown in Fig. 1. In addition, if it is not new one, the optical disk device 40 may read the title managing file 11, the thumb nail file 12, and the last play file 14; may house the in the memory unit 46; and may display a main menu on the display 44.

[0065]

If the optical disk 50 is not new one, the content titles that have been already recorded and the thumb nails corresponding to them are indicated on the main menu. In addition, when the previous end mode that is read from the last play file 14 is reproduction, the end position of reproduction is displayed; and when the previous end mode is recording, the start position of recording is displayed. Further, the information regarding the recordable time of the optical disk is also displayed.

26

[0066]

Thereby, the recording and reproducing device reaches a state capable of accepting instruction input from the operating unit 47. Accordingly, in accordance with each input such as a reproduction instruction, an edit instruction, and a recording instruction from the operating unit 47, the recording and reproducing device may start respective operations. Further, when an eject instruction of the optical disk 50 is inputted from the operating unit 47, the recording and reproducing device may eject the optical disk 50.

[0067]

Next, the operation upon recording will be described below.

[0068]

Upon recording, on the basis of the information from a clock mechanism incorporated in the device, the recording start date information is automatically recorded in the title managing file 11 of the root directory 1; and upon end of recording, the recording time length information is automatically recorded in the title managing file 11 of the root directory 1. As the information recorded in this time, the information such as a recording date, a recording hour, a recording time, and a recording mode is stored in the title managing file 11. In addition, the titles of respective contents can be inputted as the character information so that the user can easily determine the contents. In the titles, the decode data of the auxiliary

27

information EPG (Electric Program Guide) such as digital broadcast can be also automatically described. In addition, in the event of housing plural pieces of disk storage mediums and managing them in one cartridge, in the title managing file 11, the number of pieces of disk storage mediums in the cartridge and an identification ID to identify respective disk storage mediums or the like are stored.

[0069]

In addition, in the thumb nail file 12 of the root directory 1, upon start of recording the contents, the first picture is automatically recorded as a thumb nail picture, however, it is also possible to replace it with an arbitrary picture by the user after recording the contents.

[0070]

When recording the video contents in the video file directory 3, the picture data are subjected to an MPEG 2-compression coding and the voice data are subjected to an MPEG-voice coding; and then, they are made to be streams of GOP units and they are recorded in the MVF file 31 with divided in ECC block units. At this point, the streams in the GOP are lined in the order of the compressed picture data and the compressed voice data. In addition, a size of the ECC block is generally about 32 KB, however, there is no change in effect in the other size.

[0071]

In this case, on the basis of the MVF file 31, the MAP file 32 managing the MVF file 31 in GOP units may record an ECC block address from the head position of the MVF file of the object GOP, the number of ECC blocks of the object GOP, the number of ECC blocks of the I-Picture in the object GOP, a start frame position and an end frame position in the object GOP, an offset address from the ECC block address of the object GOP of the compressed voice data, and the number of ECC blocks of the compressed voice data in the object GOP in the file managing directory 2 in GOP units.

[0072]

In this case, the ECC block offset address of the compressed voice data has the same function even at the address from the head position of the MVF file, however, a memory amount necessary for storage is larger than the offset address.

[0073]

If the recording operation is finished, the PPC file 21 having the same content as that of the created MAP file 31 is created in the managing file directory 2. This results from the fact that the MAP file serves to manage the MVF file for edit and erase, and on the contrary, the PPC file enables the user to create or edit the index at an arbitrary position by using the thumb nail after recording the contents. The edit operation will be described later.

[0074]

29

FIG. 8 is a flow chart showing the recording operation. In accordance with the recording instruction input from the operating unit 47, the recording operation is started. At first, a downsized picture of a head picture at the start of reproducing the contents is created as thumb nail data, and it is stored in the memory unit 46. Consequently, MAP header data is created in the MAP file 32 of the video file directory 3. In the MAP header data, the information regarding in what condition the MVF file is coded is recorded. The header data may include a maximum coding rate, a GOP configuration, and a horizon/vertical resolution of the inputted picture or the like. The picture data may create the compressed data by using the MPEG 2 picture encoder 41, and the voice data may create the compressed data by using the MPEG voice encoder 53. The multiplexer 48 may create streams in ECC block units in the order of the compressed picture data and the compressed voice data for each GOP, and then, they are recorded as the MPEG data in the MVF file 31. Together with recording the MPEG data for each GOP, the MAP data is updated. This operation will be performed until a stop instruction is inputted from the operating unit 47 if there is a vacant area in the optical disk 50. If there is no vacant area in the optical disk 50 or the stop instruction is inputted from the operating unit 47, the MAP file 32 is saved and the PPC file 21 having the same content as that of the MAP file 32 is saved. In addition, by using the thumb nail data that is created upon start of recording,

30

the thumb nail file 12 is updated and saved, and in the last play file 14, the names of the recorded contents and the recording start positions are saved, and at last, the title managing file 11 is updated and saved.

[0075]

Next, the reproducing operation of the recorded contents will be described below.

[0076]

According to the present embodiment, since a plurality of video contents is recorded in one piece of disk storage medium, the MVF file No. 1 and the MVF file No. 2 are recorded in one piece of optical disk.

[0077]

After inserting an optical disk (or a cartridge) into the reproducing device, if the user selects the content and issues the reproduction instruction, the PPC file 21 corresponding to the designated content is read from the managing file directory 2 to be stored in the memory unit 46; and if there is the thumb nail file 22 corresponding to the designated content, the thumb nail file 22 is read from the managing file directory 2 to be stored in the memory unit 46. In addition, the MAP file 32 corresponding to the MVF file 31, to which the PPC file 21 refers, is stored in the reading memory unit 46; in accordance with a GOP reproduction order designated by the PPC file 21, the GOP information is reconstructed; in accordance with the GOP

31

information, the data of the MVF file 31 is read; the divider 49 divides the compressed picture data from the compressed voice data; and the compressed picture data and the compressed voice data are decoded and outputted by using the MPEG 2 picture decoder 42 and the MPEG voice decoder 54, respectively. In this case, in the case that there is the thumb nail file 22 that is created by the user due to the edit operation, it is possible to start the reproduction from the arbitrary GOP position by using the GOP position designated by the thumb nail data and the thumb nail data of the edited content.

[0078]

In addition, according to a reproduction method identical with a sequential media such as a video tape or the like, the MAP files 32 are lined in the order of the recording date so as to rearrange the GOP information in the disk or to the all disks in the cartridge so as to reproduce the contents in the order of the older recording data. Thereby, without designating the content, the user can watch the all contents in the disk by rotation.

[0079]

FIG. 9 is a flow chart showing the reproducing operation. In the drawing, from the operating unit 47, the content to be reproduced is selected and in accordance with the reproducing instruction input, the reproducing operation may start. In the case of selecting the content to be reproduced, by using the

information that is read from the last play file 14, it is possible to inform the user of the previous reproduction end position or to inform the user of the information regarding the content that is recorded but is not subjected to the reproducing processing.

[0080]

If the reproducing operation starts, the PPC file 21 of the selected content is read from the managing file directory 2 of the optical disk 50 to be expanded in the memory unit 46. In addition, the MAP file 32 referred by the PPC file 21 is read, and in accordance with an edit program of the PPC file 21, the above-described information such as a name of the referred MVF file, an ECC block address, the number of ECC blocks, and the number of ECC blocks of an I-Picture in the GOP for each GOP is expanded in the memory unit 46. In accordance with this GOP information, the compressed data is read from the optical disk 50, decoding the picture/voice data, and the contents are reproduced. At this point, if the stop instruction is inputted from the operating unit 47, manual stop processing is performed and the last play file 14 is updated. In addition, even if the stop instruction is not inputted from the operating unit 47, when the reproduction of the content is finished, program stop processing is performed and the last play file 14 is updated.

[0081]

In the event of the reproducing processing from the

33

above-described arbitrary GOP position using the thumb nail file 22, after the MAP file is expanded, jumping to the ECC block address that is designated by the designated GOP position, reading and reproducing processing of the MVF file 31 is started.

[0082]

Next, the operation of editing the recorded contents will be described below.

[0083]

The edit operation has two kinds of edit methods, namely, an edit method only regarding the GOP information of the PPC file 21 and an edit method of partially deleting the MVF file 31 and reconstructing the information of the MAP file 32.

[0084]

At first, the edit method only regarding the GOP information of the PPC file 21 will be described below.

[0085]

When the user wants to reproduce the content from among the recorded contents as skipping an unnecessary portion, for example, a CM part, it is possible to do so by designating a frame position to be deleted and changing the GOP information of the PPC file 21. In other words, when reproducing start frame positional information in the GOP in the PPC file 21 and reproducing stop frame positional information are rewritten and the MPEG picture encoder decodes the compressed picture data by using these start/stop frame positional information, the

34

display 44 is instructed whether or not to output the decoded picture data.

[0086]

In this case, according to the edit operation, the content to be edited is reproduced. For example, when the picture to be skipped starts, an operational key to instruct skipping is operated, and then, when the picture to be reproduced starts, end of skipping is instructed. Due to this instruction input, the unnecessary portion is deleted from the PPC file 21 and the GOP positional information is changed.

[0087]

In addition, in the event of connecting the contents, a reproducing stop frame position of one MVF file for connection and a reproducing start frame position of the other MVF file for connection are designated and the GOP information in the PPC file is reconstructed; and thereby, without connecting real picture data, the picture data can be continuously reproduced.

[0088]

As an example, an example of the CM skipping will be described below with reference to FIG. 10, FIG. 11, and FIG. 12. At first, an example of skipping the CM portion in the MVF file 31 in FIG. 10 will be described. As shown in FIG. 11, an ECC bock address from a start position of the MVF file, the number of ECC blocks of the GOP, the number of ECC blocks of an I-Picture in the GOP, a start frame position in the GOP, a end frame position

35

in the GOP, an ECC block address of the compressed voice data, and the number of ECC blocks of the compressed voice data are stored in the PPC file 21 as the GOP information. For example, a tenth GOP is composed of blocks from a 292 ECC block to a 13 ECC block; the I-Picture is composed of a 3 ECC block among them to reproduce from a first frame to a fifteenth frame. In addition, since an offset address of voice data is 12, an ECC bock address on a real MVF file is composed of the ECC blocks from a 304 (= 292 + 12) ECC block to a 1 ECC block.

[0089]

As shown in FIG. 11 and FIG. 12, when deleting the CM part from a fifth frame of a tenth GOP to a twelfth frame of a thirty-fifth GOP, an end frame position of the tenth GOP of the PPC file 21 is changed from 15 into 4; the information from an eleventh GOP to a thirty-fourth GOP is deleted; and a start frame position of the thirty-fifth GOP is changed from 1 to 13. Due to this change of the PPC file 21, the MPEG 2 picture decoder 42 may output a reproduced picture from a thirteenth frame of a thirty-fifth frame to the display 44 after starting the reproduction of the tenth GOP and outputting from the first frame to the fourth frame to the display 44.

[0090]

Erase of a picture part in edit of picture and voice data may include erase in GOP units and erase in frame units. According to the erase in GOP units, if the GOP is composed of,

36

for example, 15 frame units, it is possible to erase the picture

and voice data in 15 frame units, so that the MVF file 31 is

erased in GOP units. When erasing the data in frame units, the

picture data that is created by the MPEG 2 picture coding system

is stored in the MVF file 31 and the picture data cannot be erased

in 1 frame units, so that the same function as erasing is realized

by rewriting the start frame position of the MAP file and the

end frame positional information thereof. FIG. 13 shows a

constitutional example of the GOP. In the drawing, an I-Picture

of a coded picture in a frame is represented by I, a P-Picture

of an estimated picture in a forward predicted picture is

represented by P, and a B-Picture of a bi-directional predicted

picture is represented by B; and they are provide with a frame

number in the GOP by a subscript, respectively (for example,

P4 means the P-Picture of a fourth frame in the GOP). When trying

to delete from a ninth frame to a twelfth frame of this GOP,

since P10 is necessary in order to reproduce B7 and P12, these

frames cannot be deleted. As a result, in the event of erasing

an edit object frame from the MVF data, an object GOP should

be reproduced and recoding should be required; and this makes

the processing complicated. According to the present

embodiment, in erasing the data in frame units, the data is not

deleted in practice but on the MAP file, a reproducing start

frame position and a reproducing end frame position are

instructed and the MPEG 2 picture decoder is operated so that

it does not display the unnecessary frame upon reproducing the data. Thereby, the user can watch the same details as the contents that are deleted in frame units.

[0091]

Next, the case using the MVF correlation managing file (LNK file) 13 will be described below. The LNK file 13 serves to competitively manage the PPC file 21 referring to the MVF file 31 of an erasing object when carrying out the edit operation including entirely or partially erasing the MVF file 31. The LNK file 13 is configured so that a PPC file name corresponding to a certain MVF file and a GOP position referred by the MVF are stored therein. At this point, in order to make the competitive management simple, only by the PPC file name corresponding to the MVF file name, it is possible to carry out the competitive management.

[0092]

For example, in the case that a certain MVF file 31 is referred by two PPC files 21, if the MVF file 31 is tried to be deleted by using one PPC file 21, with reference to the LNK file 13, it is found that the other PPC file 21 refers to this MVF file 31. Therefore, if the MVF file is deleted, discordance occurs in the other PPC file. In order to avoid this, there are two methods, namely, a method that the user solves competition of the MVF files by manual and a method that the recording and editing device automatically solve this.

[0093]

　　　In the case that the user solves the competition by manual, it is indicated to the user that the MVF file 31 cannot be deleted and the user deletes a referred part of this MVF file from the other PPC file, and thereby, it is possible to delete and connect the MVF files 31 as the edit object.

[0094]

　　　If it is found that a PPC file refers to the MVF file as the edit object depending on the LNK file, the recording and editing device may inform the user that the other PPC file refers to the MVF file as the edit object.　If the user continues the edit operation and partially deletes the MVF file, the PPC file referring to the MVF file before being edited will refer to a picture frame that is different from the content intended by the user.　Therefore, if there is no referred GOP data in the MVF file, an object GOP area is deleted from the PPC file; and if there is the referred GOP data but the GOP number should be changed, namely, if a GOP address subsequent to the deleted GOP is referred, by giving the referred GOP address number on the basis of the edited information, the competition can be avoided.

[0095]

　　　In addition, since there is the PPC file 21 in respective disk storage mediums in the cartridge, the competitive management is carried out in the edit operation in the cartridge and a competitive inspection of the PPC file 21 in the all disks is

39

necessary, and this makes the high-speed edit operation difficult. On the contrary, by using the LNK file 13, it is possible to carry out the competitive management of many contents that are recorded in the disk or in the cartridge, and this leads to the high-speed and safe edit operation.

[0096]

FIG. 14 shows an erasing example in GOP units of the MVF file. The drawing shows that a twenty-fourth GOP is deleted from a tenth GOP of the MVF file and a picture data portion represented by A1 and a picture data portion represented by A2 are processed by the edit operation. In this case, if a PPC file No. 2 refers from a fifty-fifth GOP to a fifty-ninth GOP of the MVF file before the edit operation, after the edit operation, the areas from the tenth GOP to the twenty-fourth GOP are deleted, and this results in the fact that the GOP position of the MVF file, to which the PPC file No. 2 primarily refers, ranges from a fortieth GOP.

[0097]

The recording and editing device to automatically avoid competition is located behind the deleted area in which the MVF file position referred by the PPC file No. 2, the original reference address 55 and the deleted GOP area is a 15 GOP, so that its reference start GOP address ranges from the fifty-fifth GOP to a fortieth GOP. In addition, as same as the above, a reference end GOP ranges from a fifty-ninth GOP to a forty-fourth

40

GOP.

[0098]

Thus, in the event of carrying out the edit operation including the area deletion, if there is a PPC file referring to the MVF file of the edit object, this involves a problem that the referred GOP position is displaced. In this case, by using the LNK file, the MVF file can be managed so as to avoid a logical number displacement.

[0099]

FIG. 15 is a flow chart showing the edit operation. In the drawing, in accordance with an edit instruction input from the operating unit 47, the edit operation is started. Selecting the content to be edited, the corresponding PPC file 21 and MAP file 32 are read from the optical disk 50 into the memory unit 46 through the optical disk device 40, and the reproducing operation is started.

[0100]

At this point, the user selects the picture data or the voice data to be inserted in an edit point at the position of this data and performs cut-in. Extracting a start GOP position after cut-in, a thumb nail picture after cut-in is created from a reproduced picture. Further, if the user wants to delete the picture data or the voice data from the edit point, selecting this data, and then, cut-out is carried out. Thus, an end GOP position is extracted after cut-in and cut-out. Due to the

41

extracted start GOP position and end GOP position, a PPC file
21 is newly created or updated. If there is other edit point
that the user wants to edit, the same edit is carried out. In
the event of saving these edit results, the MAP file 32 is updated,
the PPC file 21 and the thumb nail file 22 are created or updated
to be saved in the optical disk 50, and the title managing file
11 and the LNK file 13 are updated to be saved in the optical
disk 50.

[0101]

FIG. 18 shows a configuration of the GOP according to the
present invention. As shown in FIG. 18, an I-Picture is arranged
at its head of the GOP, and picture data and voice data are arranged
in the GOP. When recording the GOP shown in FIG. 18 in the MAP
file 32, the GOP has an ECC block address from a head of the
MVF file 31, the total number of ECC blocks of the object GOP,
the number of ECC blocks of the I-Picture, the information
regarding a start frame and an end frame in the object GOP, and
the recording start positional information of the voice data.

[0102]

Specifically, a GOP No. 1 may include an ECC block address:
1, the total number of ECC blocks: 15, the number of ECC blocks
of the I-Picture: 2, a start frame: 1, an end frame: 15, and
the recording start positional information of the voice data:
12. In addition, a GOP No. 2 may include an ECC block address:
16, the total number of ECC blocks: 15, the number of ECC blocks

42

of the I-Picture: 3, a start frame: 16, an end frame: 30, and

the recording start positional information of the voice data:

27. In addition, a predetermined area is allocated to the voice

data area and a vacant area is subjected to stuffing.

[0103]

FIG. 19 shows a division example of a voice data area.

FIG. 19(a) is an example of a stereo 1 channel. In FIG. 19(a),

the voice data area is divided into two, an L channel and an

R channel of the stereo are recorded in one area and the other

area is subjected to stuffing. FIG. 19(b) shows an example of

a stereo 2 channels. In FIG. 19(b), the voice data area is divided

into two, a L1 channel and a R1 channel of the stereo are recorded

in one area and a L2 channel and a R2 channel of the stereo are

recorded in the other area. FIG. 19(c) is an example of a monaural

sound. In FIG. 19(c), the voice data area is divided into two,

and Japanese is recorded in one area and the other area is subjected

to stuffing. FIG. 19(d) is an example of a sub sound. In FIG.

19(d), the voice data area is divided into two, Japanese is

recorded in one area, and English is recorded in the other area.

[0104]

Thus, since the voice data recording area is made in ECC

block units, it is possible to only replace the voice data or

to insert the voice data into a vacant area without correcting

errors of the picture data that is compression coded upon editing

the voice. Thereby, it is possible to edit the voice data

separately from edit of the picture.

[0105]

Thereby, by selecting any of the stereo 1 channel or the stereo 2 channel of the voice data, the user can record or reproduce the voice data; and by selecting any of Japanese or English, the user can record or reproduce the voice data. Alternatively, by adding an effect sound and other voice data to the voice data that is recorded upon the initial recording and recording them, the user can reproduce them simultaneously.